the application and allowance of all of the pending claims are respectfully requested in view of the above amendments and the following remarks.

Claims 1, 2, 4, 7-9, 17 and 19-21 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,759,926 to Pike et al. ("Pike") and optionally as evidence, for example, by U.S. Patent No. 5,753,351 to Yoshida et al. ("Yoshida") or U.S. Patent No. 5,814,569 to Suzuki et al. ("Suzuki"). Claims 1-9 and 12-21 further stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pike in view of U.S. Patent No. 5,790,926 to Mizoe et al. ("Mizoe"). Claims 10 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pike alone or Pike in view of Mizoe, and further in view of U.S. Patent No. 5,277,976 to Hogle et al. ("Hogle") or U.S. Patent No. 5,985,193 to Harrington et al. ("Harrington"). Applicant respectfully traverses these rejections insofar as they apply to amended claim 1.

Amended claim 1 recites a method of forming a nonwoven fabric from a process employing fiber splitting in line with fiber extrusion. The method includes extruding an array of plural-component fibers, each comprising first and second materials having a relative difference in heat shrinkage of at least about ten percent, depositing the array of plural-component fibers onto a moving surface to form a web, applying heat to the web to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials, and processing the web to form the nonwoven fabric. It is respectfully submitted that none of the cited references discloses or suggests a method of employing fiber splitting in line with fiber extrusion as recited in claim 1.

Pike discloses a method of providing a splittable conjugate fiber containing at least two incompatible polymers, where each splittable fiber contains at least two incompatible component polymers and at least one of the component polymers is hydrophilic (see, e.g., Col. 3, lines 19-44 of Pike). When hydrophobic or insufficiently hydrophilic polymers are utilized for the hydrophilic polymer component, Pike discloses that these polymers must be hydrophilically modified (see, e.g., Col. 5, lines 55-62 and Col. 6, lines 31-35). Thus, clearly at least one material in the splittable conjugate fiber of Pike must be hydrophilic (i.e., either naturally or by modification of a hydrophobic polymer component). Pike further discloses that the splittable conjugate fiber splits when the fiber is contacted with a hot aqueous split-inducing medium. In

addition, Pike discloses that the polymers of the fiber are incompatible in that the polymers have a difference in solubility parameter (see, e.g., Col. 7, lines 42-59 of Pike). Thus, the method taught by Pike relies upon a difference in solubility parameter rather than a heat shrinkage differential of the polymer components forming the splittable conjugate fiber when an aqueous split-inducing medium is applied to the fiber.

While acknowledging that Pike does not explicitly disclose the incompatible polymers as having a relative difference in heat shrinkage, it is alleged in the present Office Action that such difference in heat shrinkage is inherent due to the polymer pairs being derived from different polymer materials. Optionally, Yoshida and Suzuki are relied upon to allege that polyolefin-polyester pairs and polyamide-polyester pairs inherently have different relative heat shrinkage.

It is respectfully submitted that whether different polymer materials in fact have inherently different relative heat shrinkage characteristics in and of itself cannot result in an anticipation of claim 1 in view of Pike. Claim 1 requires the step of applying heat to the web to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials. In other words, the difference in heat shrinkage **must be** of a sufficient amount such that the fiber segments split when heat is applied to the web in an in line fiber extrusion and splitting process. It was determined by the inventors that, within an in line process, a threshold relative difference in heat shrinkage is essential to reliably and sufficiently effect acceptable separation of fiber segments. Thus, even assuming that the different polymer components utilized to form the splittable conjugate fiber in Pike inherently have a different relative heat shrinkage, such heat shrinkage differential will not necessarily result in splitting of the fiber components in an in line fiber extrusion and splitting process simply by applying heat to the fiber in Pike.

In order to further emphasize the importance of the difference in relative heat shrinkage to ensure separation of the claimed fiber segments in an in line fiber extrusion and splitting process, claim 1 was amended to include the additional limitation of claim 3. Specifically, claim 1 was amended to include the limitation of the first and second materials included in the plural fiber components having a relative difference in heat shrinkage of at least about ten percent. Thus, even assuming that the fiber components of Pike have a relative difference in heat shrinkage, there is no disclosure or suggestion in Pike of the heat shrinkage being on the order of

at least about ten percent as recited in amended claim 1. Accordingly, the rejection of claim 1 as being anticipated by Pike should be withdrawn.

Claims 2, 4, 7-9, 17 and 19-21 each depend, either directly or indirectly, from claim 1. Accordingly, the rejection of these claims based solely upon Pike should also be withdrawn.

Mizoe is relied upon in combination with Pike in the present Office Action to further reject claim 1 as well as additional claims, including claim 3. In particular, it is asserted in the present Office Action that, even if the incompatible pairs of polymers taught by Pike do not inherently have a relative difference in thermal shrinkage, it would have been obvious to provide a pair of incompatible polymers with a relative difference in thermal shrinkage in view of Mizoe. Mizoe discloses forming split fibers for use in a charging member for an electrophotographic apparatus. The split fibers of Mizoe may be obtained by forming a spun product of incompatible thermoplastic resins, followed by subjecting the product to stretching and heat treatment (see Col. 5, lines 38-50). Upon heating, the product is opened and split due to differences in shrinkage at the respective portions.

It is respectfully submitted that there is no motivation to combine the teachings of Mizoe with Pike. As previously noted, Pike is concerned with splitting polymer components in a splittable conjugate fiber by controlling the difference in solubility parameter of the incompatible polymer components as well as providing at least one hydrophilic polymer component. The method employed by Pike is simply not concerned with heat shrinkage differential characteristics of the incompatible polymer components to achieve splitting of the fiber. In addition, it is not clear why one skilled in the art utilizing the teachings of Pike would be motivated to rely on the teachings of Mizoe when effective splitting is already achieved based upon exploitation of the difference in solubility parameter as taught in Pike. One of the motivational factors asserted in the present Office Action (see Paragraph 5, page 5) for combining Pike with Mizoe is that the process of Pike would be simplified by obviating the need to modify the polymers to become hydrophilic and to dry the wet fiber web. However, modification of the process of Pike in this manner would in essence teach away from the invention disclosed in Pike (namely, the splitting of conjugate fibers by relying on a difference in solubility parameter and **not** a heat shrinkage differential of the incompatible polymer components), because the process of Pike **requires** at least one hydrophilic (or hydrophilically modified) polymer component and an aqueous split-inducing medium to effect splitting of the conjugate fiber.

Moreover, even assuming that it would be reasonable to combine the teachings of Mizoe with Pike, there is simply no disclosure or suggestion in Mizoe of a conjugate fiber product including first and second materials having a relative difference in heat shrinkage of at least about ten percent as recited in claim 1. Contrary to the assertion in the present Office Action (see Paragraph 5, pages 5-6) that one skilled in the art would have determined by routine experimentation a workable relative difference in heat shrinkage as set forth in claim 3, it is respectfully submitted that the relative difference in heat shrinkage associated with the present invention is not merely for any fiber splitting process. Applicant acknowledges that it is generally known in the art to split conjugate fibers into segments by heat treatment as a result of a difference in heat shrinkage of at least two polymer components in the fiber. This is clearly taught, for example, in Mizoe. However, what was not generally known in the art prior to the present invention, and, furthermore, what is not disclosed or suggested in Mizoe or in any of the other cited references, is an in line process that includes both fiber extrusion and fiber splitting in which separation of fiber segments is achieved due to a difference in heat shrinkage of materials in the fiber segments. In particular, the inventors of the present application have determined that a heat shrinkage difference of at least about ten percent ensures that the plural component fiber will separate into segments when heat is applied to the web in a process employing fiber splitting in line with fiber extrusion. Thus, it is not reasonable to assume that one skilled in the art would have determined by routine experimentation the method recited in claim 1, including the difference in relative heat shrinkage of the first and second materials of at least about ten percent, based upon the teachings of Mizoe, when Mizoe does not even disclose an in line fiber extrusion and splitting process for heat splitting conjugate fibers.

Claims 2-9 and 12-21 each depend, either directly or indirectly, from claim 1. Accordingly, the rejection of these claims based upon Pike in view of Mizoe should also be withdrawn.

Claim 5 recites the additional feature of the applying step including applying radiant heat to the web. In the present Office Action (see Paragraph 5, page 6), an assertion is made that one skilled in the art would have readily recognized and appreciated utilizing radiant energy to split conjugate fibers having relative thermal shrinkage. Applicant respectfully disagrees that it would have been readily recognized to apply radiant heat to the conjugate fibers in Pike, particularly since the method for splitting the conjugate fibers in Pike requires an aqueous split-

inducing medium so as to effect separation of incompatible components having a difference in solubility parameter. It is not clear how providing radiant energy in Pike would have any beneficial effect in enhancing separation of the incompatible polymer components of the conjugate fiber based upon their different solubility parameters. Thus, in addition to the previous remarks, claim 5 should further be allowed over Pike in view of Mizoe based upon the further limitation of applying radiant heat to the web.

Claim 6 recites the additional feature that the first and second materials are non-hydrophilic. Contrary to the assertion in the present Office Action (see Paragraph 5, page 6), Pike **requires** the use of at least one hydrophilic (or a hydrophilically modified) polymer component in the splittable conjugate fiber (see, e.g., Col. 3, lines 23-27, Col. 5, lines 55-60 and Col. 6, lines 31-34 of Pike). As previously noted, to modify Pike so as to not require any hydrophilic (or hydrophilically modified) polymer component would in essence teach away from the invention of Pike.

Claims 10 and 11 each depend, either directly or indirectly, from claim 1 and should therefore also be allowed over Pike in view of Mizoe based upon the previous remarks. In addition, these claims include further limitations that are not disclosed or suggested in any of the cited references. In particular, claim 10 recites that the extruding step includes forming plural-component fibers having a cross section in the shape of a cross, including a central segment comprising the first material and a plurality of radial segments comprising the second material and extending radially outward from the central segment. Claim 11 depends from claim 10 and includes the further feature of a plurality of radial segments comprising the first material extending radially outward from the plurality of radial segments comprising the second material.

In rejecting claims 10 and 11, a further assertion is made in the present Office Action (see Paragraph 6, page 7) that Pike is not restrictive as to the shape of the fibers and also discloses the desirability of forming fibers with a "higher surface area", and further that it is well known in the art to form fibers having a cross-section with a shape of a cross as exemplified in the teachings of either Hogle or Harrington. Applicant respectfully disagrees that Hogle or Harrington could be reasonably combined with Pike to obtain a fiber cross section as recited in claim 10 or claim 11.

While both Hogle and Harrington disclose a fiber cross section in the form of a cross (see Figs. 4-8 of Hogle and Fig. 1(f) of Harrington), such fiber cross section simply does not disclose or suggest a central segment of the cross comprising a first material and radially extending

segments comprising a second material as recited in claim 10, let alone the additional feature of radially extending segments comprising the first material extending from the radially extending segments comprising the second material as recited in claim 11. Thus, it is unclear as to exactly how the teachings of Hogle or Harrington could be combined with Pike to render claims 10 and 11 obvious simply from a disclosure of what appears to be a single component fiber (i.e., not a conjugate fiber capable of splitting into two or more components) having a cross section in the shape of a cross. Therefore, withrawal of the rejection of claims 10 and 11 based upon Pike in view of Mizoe and further in view of Hogle or Harrington is respectfully requested.

New claim 101 recites another method of forming a nonwoven fabric from a process employing fiber splitting in line with fiber extrusion. The method includes extruding an array of plural-component fibers, each comprising first and second materials having a relative difference in heat shrinkage, depositing the array of plural-component fibers onto a moving surface to form a web, applying dry heat to the web to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials, and processing the web to form the nonwoven fabric. It is respectfully submitted that none of the cited references discloses or suggests the method recited in claim 101.

As previously noted, Pike requires the application of an aqueous split-inducing medium to effect separation of incompatible polymer components in the conjugate fiber. Thus, neither Pike alone, nor Pike in combination with any of the other cited references, discloses or suggests the combined features of claim 101. Therefore, claim 101 should all be allowed over the cited art. In addition, new claims 102-120, which depend either directly or indirectly from claim 101, should also be allowed based upon the foregoing reasons.

New claim 121 recites a further method of forming a nonwoven fabric from a process employing fiber splitting in line with fiber extrusion. The method includes extruding an array of plural-component fibers, each comprising first and second materials having a relative difference in heat shrinkage and where the first and second materials are non-hydrophilic, depositing the array of plural-component fibers onto a moving surface to form a web, applying heat to the web to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials, and processing the web to form the

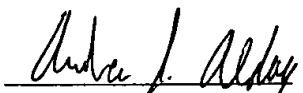
nonwoven fabric. It is respectfully submitted that none of the cited references discloses or suggests the method recited in claim 121.

As previously noted, Pike requires that at least one of the incompatible polymer components forming the splittable conjugate fiber to be hydrophilic or hydrophilically modified. Thus, Pike, alone or in combination with any of the cited references, does not disclose or suggest the combined features of claim 121. Therefore, claim 121 should all be allowed over the cited art. In addition, new claims 122-135, which depend either directly or indirectly from claim 121, should also be allowed based upon the foregoing reasons.

In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1-21 and 101-135. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Filed concurrently herewith is a Petition (with payment) for an extension of time for two months to respond to the outstanding Office Action. Applicant hereby petitions for any additional extension of time that may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 05-0460.

Respectfully submitted,



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APPENDIX

Amend claim 1 as follows:

--1. (Amended) A method of forming a nonwoven fabric from a process employing fiber splitting in line with fiber extrusion, the method comprising the steps of:

extruding an array of plural-component fibers, each comprising first and second materials having a relative difference in heat shrinkage of at least about ten percent;

depositing the array of plural-component fibers onto a moving surface to form a web;

applying heat to the web to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials; and

processing the web to form the nonwoven fabric.--